

Effect of Massage Using Camel Hump Oil Compared to Olive Oil on Muscle Tone of Children with Spastic Diplegia: Single Participant Design

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Submitted: 2015-04-30; Accepted: 2016-09-04

Abstract

Introduction: The aim of the present study was to determine the effectiveness of massage with camel hump oil on muscle tone in the lower limb compared with olive oil on children with spastic diplegia cerebral palsy. **Materials and Methods:** The study was performed using a single subject design. Six children were selected based on available sampling. The study lasted 10 weeks for each person, which includes five phases: 1-baseline (two weeks), 2-massage with olive oil (two weeks), 3- baseline (two weeks), 4- massage with camel hump oil (two weeks), and 5- baseline (two weeks). At each stage, muscle tones of Hamstring, hip adductors, and calf muscles were evaluated using the Modified Ashworth Scale. The visual analysis and Mann-whitney U test were used to evaluate differences between phases. **Results:** A significant difference was observed between the adductor (in 4 cases), hamstrings (in 4 cases), and calf muscles tone (in two cases) ($P<0.05$), demonstrating the higher effect of massage with camel hump oil compared to that with olive oil. **Conclusion:** It seems that camel hump oil may be more effective in some cases than olive oil in reducing muscle tone, but the overall conclusion requires further studies.

Keywords: Camel hump oil; Massage; Muscle tone; Spastic diplegia

Please cite this paper as: Kalantari M, Shafiee Z, Irani A, Akbarzadeh Baghban A, Zhiani F. Effect of Massage Using Camel Hump Oil Compared to Olive Oil on Muscle Tone of Children with Spastic Diplegia: Single Participant Design. J Clin Physio Res. 2017; 2(1): 32-38. Doi: 10.22037/jcpr.2017.05

Introduction

Cerebral palsy is a non-progressive disorder in the development of brain leading to a group of neurological and motor defects related to the body posture [1] with the incidence of 1.4 to 2.4 per 1,000 live births. It is estimated that about half a million children and adults in America are suffering from some form of cerebral palsy [2] and more than 75% of children with cerebral palsy have spasticity or muscle tone abnormality [1]. Spasticity is a muscle disorder characterized by the speed-dependent resistance against the motion and increased deep tendon reflex [3]. To reduce spasticity, rehabilitation program, brace prescription, surgery, and Botox injection are performed [4].

The effect of these interventions has not been proven well and none of them is considered as definitive treatment highlighting the need for more studies in this field [4, 5]. In the

rehabilitation program, massage is also considered as one of the ways to alleviate the spasms [5]. In complementary medicine, massage therapy is one of the most common methods of treatment and the main cause of this issue is the history of massage and its integral link with the growth of the child. When the human is touched by another person, he reacts immediately, and in fact physiological factors are not separate from sensory factors [6].

According to the previous studies, massage therapy is effective in the treatment of many problems caused by cerebral palsy. It can also reduce muscle tone, increase muscles' range of motion, improve sleep pattern, reduce anxiety, reduce pain, improve bowel and bladder, and enhance motor skills in children with cerebral palsy. In addition, it is shown to increase social and communicative skills [5, 7, 8].

Swedish massage was used in the present study because it is a relaxing massage, which is accepted by the children, learned

easily, and taught easily by to parents. An important advantage of Swedish stroke massage is that it transmits certain feedback from the soft tissue of the child's body to both massager and the child [9]. This massage includes passive touch, superficial effleurage techniques, Percussion stroke, deep neuromuscular such as Petri sage massage, and passive range of motion. In Swedish massage, specific for children, special techniques are used for sensory stimulation and training to acquire relaxation, and great emphasis is given on caring for the child during the massage so that it is not painful [10].

According to clinical observations of the researchers, compared to other oils, camel hump oil reduces spastic muscle tone more. Camel hump oil is hot oil obtained from camel hump. It has a combination of fatty acids including acid margaric, stearic acid, oleic acid, meristic acid, and several triglycerides, the combination that gives several unique properties to this oil including its many therapeutic uses. The effect of camel hump oil is due to triglyceride that locally leads to improved skin barrier performance, skin temperature regulation, and positive effect on the growth [11]. No research has previously examined the impact of this oil on the reduction of muscle tone in children with cerebral palsy, thus the present study was conducted in order to obtain scientific evidence for this hypothesis by investigating the effect of camel hump oil compared to olive oil used typically.

Materials and Methods

The present single participant study includes five phases (baseline, massage with olive oil, baseline, massage with camel hump oil, and baseline).

Samples: From among children with spastic diplegia cerebral palsy admitted to Iranian Rehabilitation Clinic, six children (three boys and three girls) were selected non-randomly. The inclusion criteria were children with spastic diplegia who were under 5 years without an experience of seizure during the past six months, skin diseases, wound, burns, and sensitivity to the camel hump oil. The exclusion criteria of the study included lack of family willingness to collaborate in the research, interruption of therapy sessions for any reason during the study, creation of sensitivity in the massage area, and the seizure of the child during the study.

Tools: Modified Ashworth Scale was used to assess muscle tone that is a standard scale measuring spasticity, developed by Bohannon and Smith in 1987 [12].

After selecting the samples based on the inclusion criteria, a consent form was completed by the parents. The study was carried out in 10 weeks with no intervention performed, except for routine treatments in the first two weeks. However, muscle tone of lower body limbs (hamstring of muscles, adductor, and

calf) was assessed for each participant every week.

Two weeks later, massage with olive oil was performed three days in a week (30 minutes in each session) and muscle tone was evaluated at the end of each massage session. For two weeks, the participants received routine treatment again and massage was stopped, but the muscle tone was evaluated every week. Then, massage with camel hump oil was performed for two weeks (three days per week) and muscle tone was evaluated at the end of the massage session. Finally, routine treatments continued for two weeks and muscle tone was evaluated at the end of the second week. Muscle tone was measured totally 17 times during the study. Massage was conducted only on muscles of the lower limbs. During the study, all participants received routine treatments of occupational therapy three days a week. All the evaluations were conducted by a trained evaluator who was not blind to the research process. Evaluation was conducted in the conditions in which the child was comfortable and he or she was lying on the bed in the supine position. Then, muscle tone was evaluated according to the Modified Ashworth Scale for calf, hamstring, and adductor muscles. The visual analysis and Mann-whitney U test were used to determine the effect of massage with camel hump oil in comparison with those of olive oil (13).

Results

In the current study, six children participated whose characteristics are given in Table 1. Both visual and analytical analyses were used to analyze the data.

Also, scores obtained in the phase two and four were compared. For better understanding of the difference of tone changes, diagrams level determination method was used. In this method, the lowest point of the diagram in olive oil massage phase was compared with that of massage with camel hump oil phase.

To display muscle tone changes in lower limbs during the study, diagram was used in which each of the muscles was evaluated separately; three diagrams were outlined for each participant.

Each diagram displays muscle tone changes at different five phases: the first phase relates to evaluations recorded at the end of the first week and at the end of second week before massage with olive oil, the second phase relates to six times evaluation conducted after each massage with olive oil during two intervention weeks, the third phase relates to two times evaluation at the end of the first and the second weeks before massage with camel hump oil, the fourth phase relates to six times of evaluation conducted after each session of massage with camel hump oil, and finally, the fifth phase relates to one case of evaluation at the end of the second week after the intervention.

The results showed that in participant 1 (7-month boy, GMFCS V) reduction in hamstring muscle tone ($z=3.146$ and

Table 1. Participants' characteristics

	Gender	Age	GMFCS Levels
Participant one	Male	7 months	5
Participant two	Male	4 year	4
Participant three	Female	1 year	3
Participant four	Female	9 months	3
Participant five	Male	18 months	3
Participant six	Female	4 year	4

$a=0.02$) and adductor muscles ($z=2.844$ and $a=0.004$) in massage with camel hump oil was greater than that for massage with olive oil, but reduction in calf muscles tone was not observed to be significant ($z=1.915$ and $a=0.180$) (Diagram 1).

In participant 2 (4-year-old boy, GMFCS IV), reduction in lower limbs muscles tone was significant only in adductor muscles ($z=2.519$ and $a=0.015$). However, reduction in hamstring ($z=2.015$ and $a=0.650$) and calf ($z=1.563$ and $a=0.180$) muscle tones was not observed to be significant (Diagram 2).

In participant 3 (1-year-old boy, GMFCS III), the superiority of massage with camel hump oil over massage with olive oil was shown in all the three muscles: hamstring muscle ($z=2.708$, $a=0.009$), adductor muscle ($z=2.815$, $a=0.004$), and calf muscle ($z=2.708$, $a=0.009$) (Diagram 3).

In participant 4 (9-month girl, GMFCS III), reduction in hamstring muscles in the phase of massage with camel hump oil tone was not significant ($z=1.903$, $a=0.093$), but it was significant at adductor ($z=2.345$, $a=0.026$) and calf ($z=2.866$, $a=0.004$) muscles (Diagram 4).

In participant 5 (18-month boy, GMFCS III), reduction was significant only in hamstring muscle ($z=2.559$, $a=0.015$), but changes in the adductor ($z=2.211$, $a=0.065$) and calf ($z=2.345$, $a=0.065$) muscles were not statistically significant (Diagram 5). In participant 6 (4-year-old girl, GMFCS IV), reduction was significant only in hamstring muscle ($z=2.447$, $a=0.026$), but the adductor ($z=1.915$, $a=0.180$) and calf ($z=2.166$, $a=0.065$) muscles did not show significant differences (Diagram 6).

Discussion

According to the results obtained in the present study, massage therapy with both oils of camel hump and olive were effective in reducing the spasticity of muscles of the lower limbs. It was found that all children enjoyed both massage therapies. This finding is in line with those reported in the studies conducted by Hernandez *et al.* [5] and Powell *et al.* [7].

The results showed that massage with hump camel oil lead to better results in some children. This may be due to the chemical structure of camel hump oil. In addition to three fatty acids found in olive oil, camel hump oil has a combination of fatty acids such as margaric acid, stearic acid, meristic acid, and several triglycerides [11], while olive oil has a simpler structure

composed of three acids including oleic acid, linoleic acid, and palmitic acid [14].

The remarkable point in this regard is the effect of age. Three of the six samples were under 1 year old and massage with camel hump oil was more effective on them. Out of nine Mann-Whitney tests, seven turned out to become significant, but in three participants who were older than 18 months, only three Mann-Whitney tests were observed to be significant. So, it can be concluded that age may affect the results of massage therapy. Pierce *et al.* (2010) suggested the role of passive stiffness in spasticity as children with spastic diplegic CP grow older (15).

By looking at the diagram, one can theorize about the continuation of treatment. By comparing phases 3 and 5, it can be understood that after massage with olive oil stopped, muscle tone rised more (twice times in the participant 2 and once in participants 4 and 5), while after massage with hump camel oil stopped, the rise was observed only in one case. In other words, it seems that camel hump oil, compared to olive oil, has a better long-term effect. However, in the present study, follow-up period after massage with camel hump oil was only two weeks. So, for a definitive statement, further studies are needed with longer follow-up periods.

The important issue on mechanism of the effect of massage on reducing muscle tone is the heat generated in the massaged area. Massage causes dilation of superficial veins and hereby contributes to increasing blood flow in the area massaged. Heat created increases blood supply in the massaged area leading to reduced spasticity in the massaged muscle [16]. If massage therapy is performed using oil that creates more heat in the massage area, the effects of massage therapy would be greater than the state in which oil is used merely for facilitating the massage.

Both olive oil and camel hump oil can contribute to creation of heat in the massage area, but based on the camel hump oil combinations, that includes fatty acids more than than olive oil, the heat released during the massage with camel hump oil is higher than that of olive oil since this heat is released as a result of chemical bond breaking in the structure of free fatty acids [11, 14]. In the present study, during massage therapy with camel hump oil, the therapist was feeling that the heat released was greater compared to that of olive oil and this is consistent with the nature of camel hump oil.

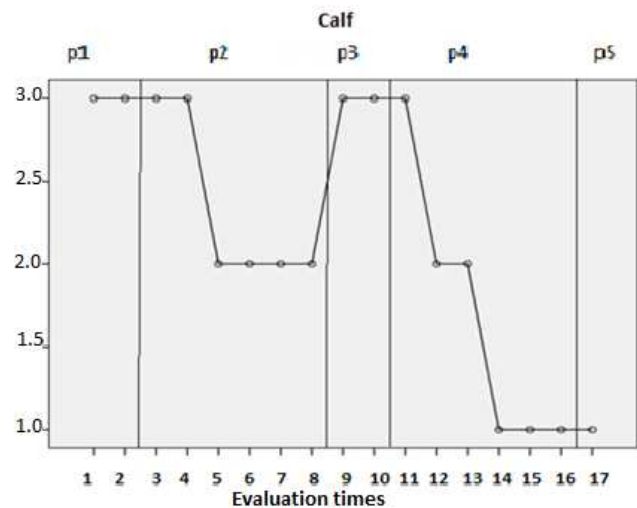
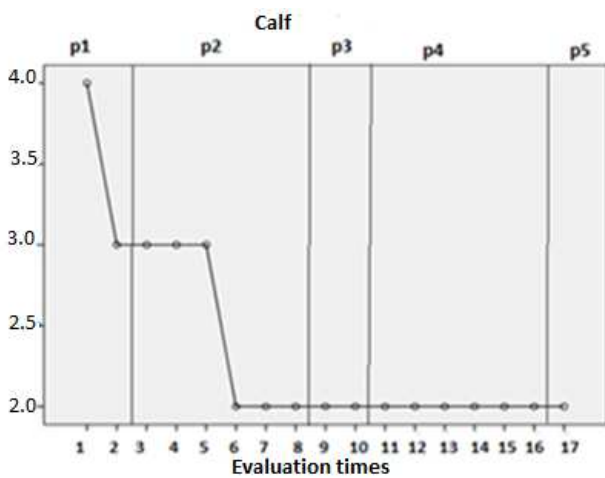
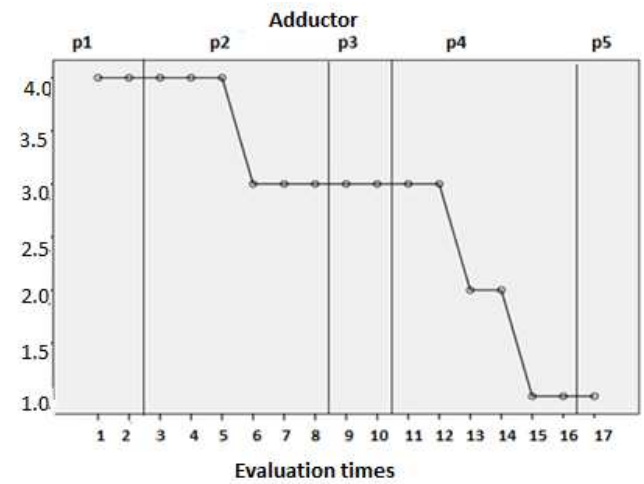
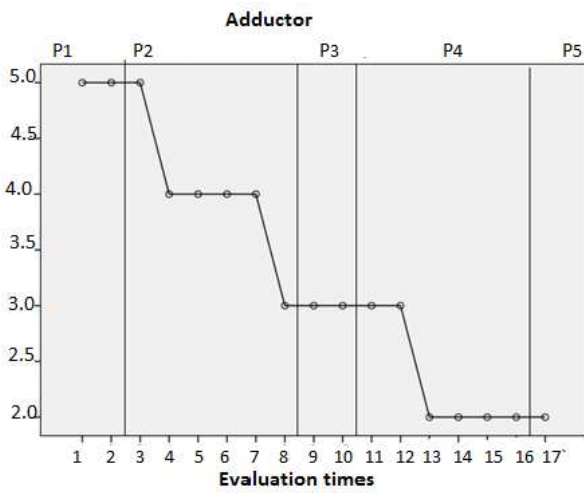
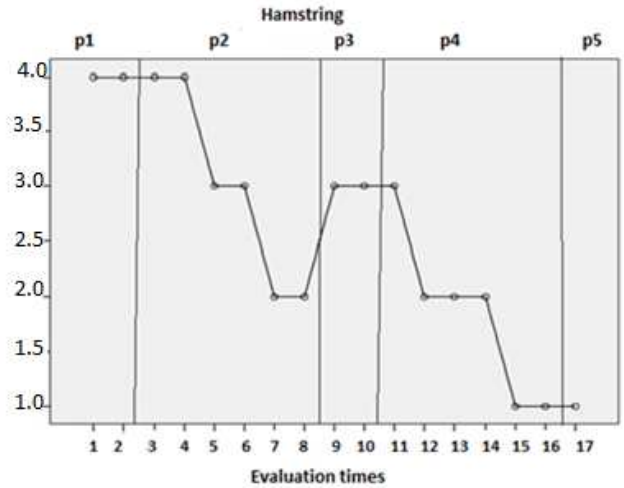
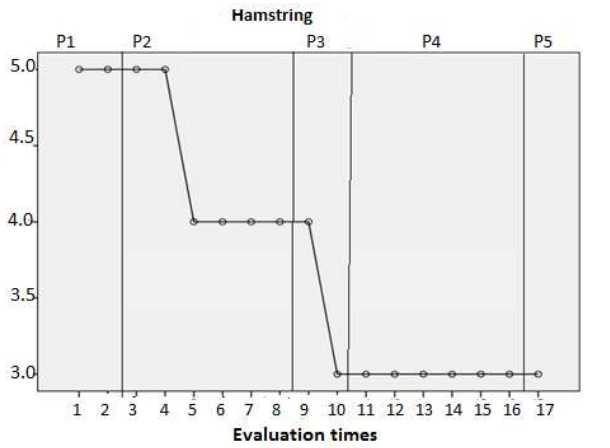


Diagram 1. Changes in hamstring, adductor, and calf muscles tone in the first sample during the studied phases

Diagram 2. Changes in hamstring, adductor, and calf muscles tone in the second sample during the studied phases

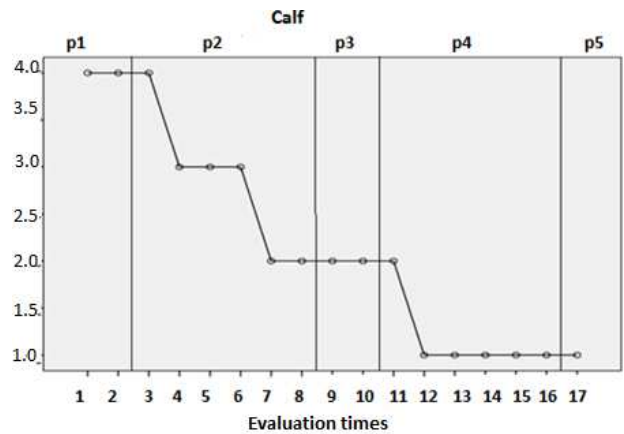
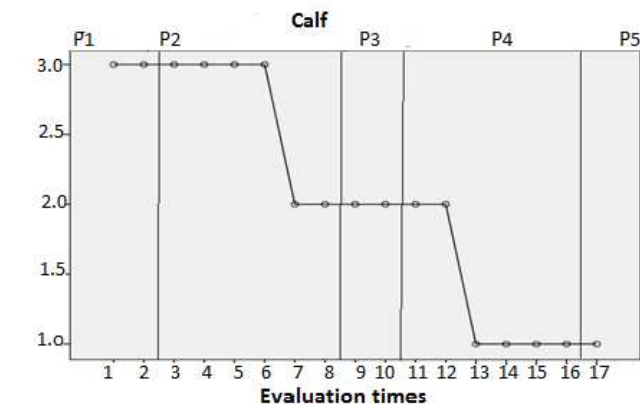
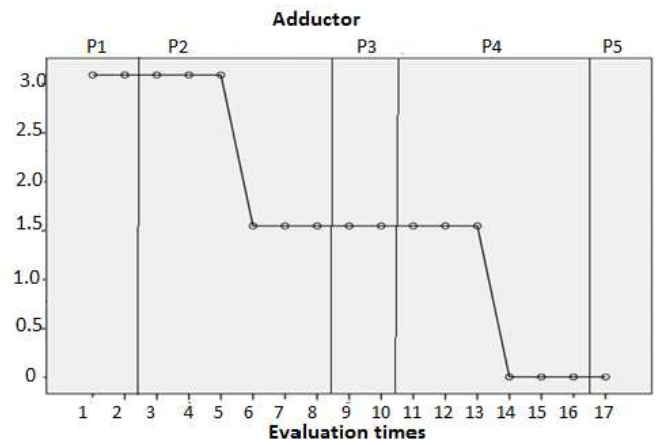
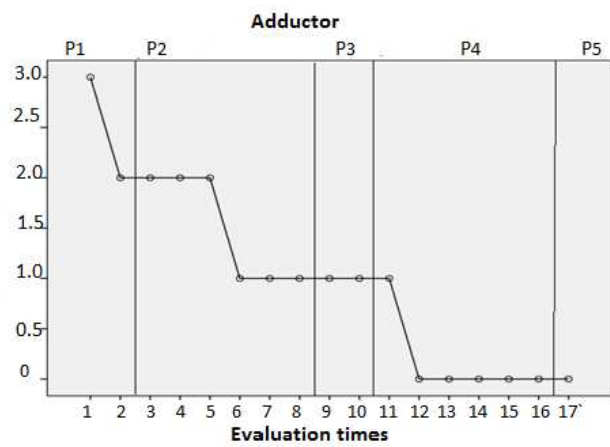
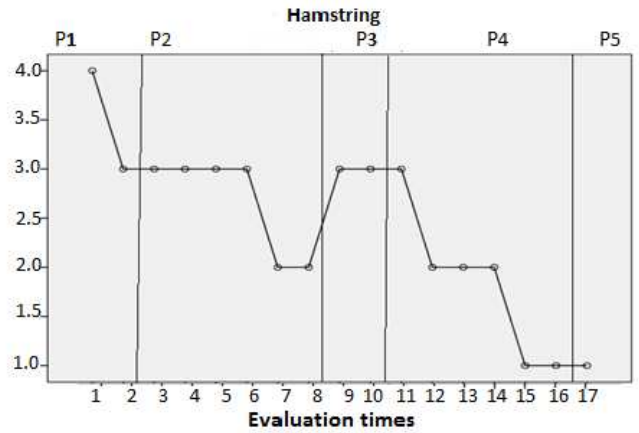
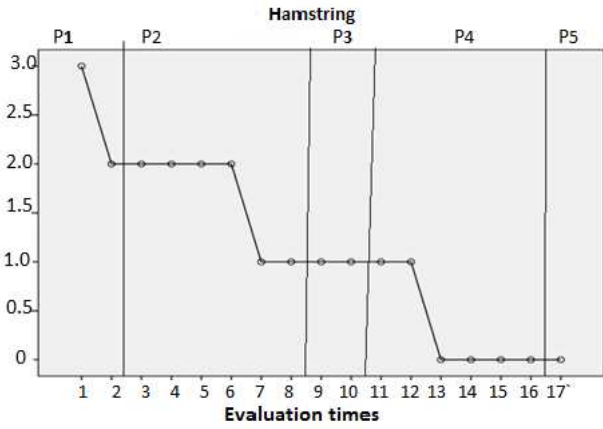


Diagram 3. Changes in hamstring, adductor, and calf muscles tone in the third sample during the studied phases

Diagram 4. Changes in hamstring, adductor, and calf muscles tone in the fourth sample during the studied phases

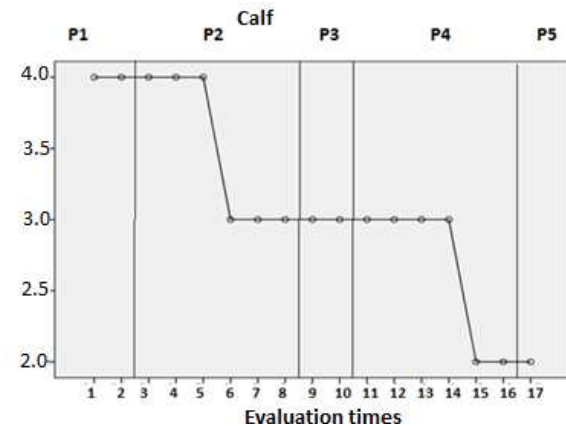
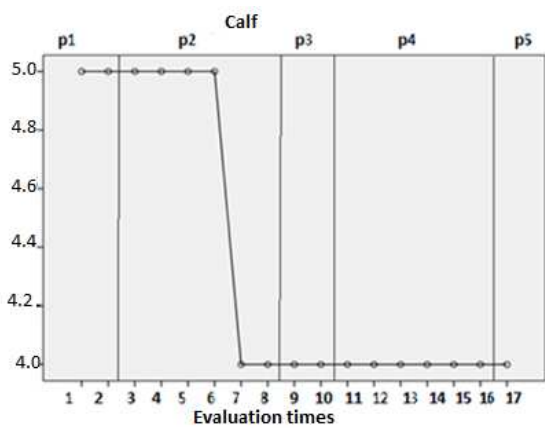
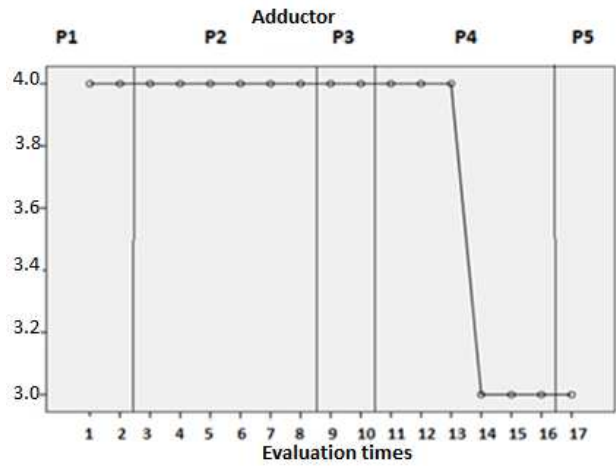
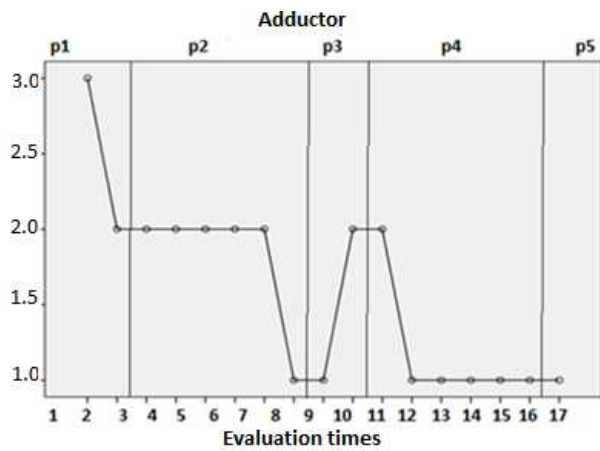
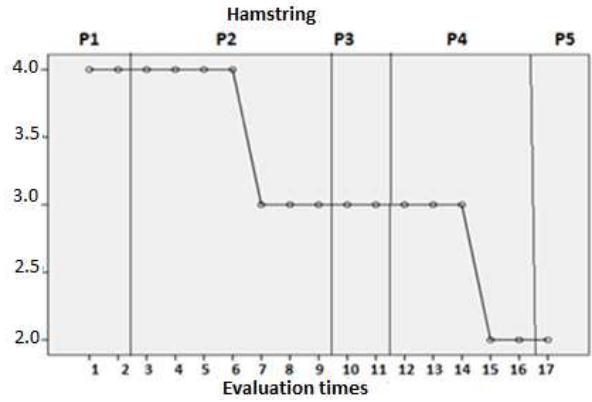
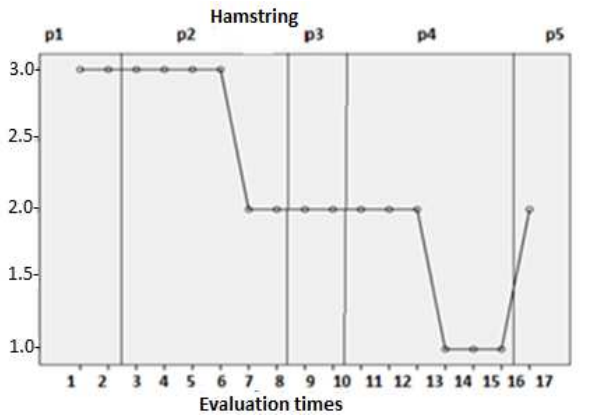


Diagram 5. Changes in hamstring, adductor, and calf muscles tone in the fifth sample during the studied phases

Diagram 6. Changes in hamstring, adductor, and calf muscles tone in the sixth sample during the studied phases

Conclusion

The results of the current study showed that Camel hump oil has better effects in some children and age may affect the results of massage therapy. But further studies are needed to achieve definitive results.

Limitations: Small sample size and thus generalizability of results are the two limitations of the current study. It is recommended that other studies be conducted to investigate the massage with camel hump oil in a randomized clinical trial study with larger sample sizes.

Acknowledgments:

None

Conflict of interest:

None

Funding support:

This research has been supported by Physiotherapy Research Center.

Authors' contributions:

All authors made substantial contributions to conception, design, acquisition, analysis and interpretation of data.

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